

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 17, 2009 has been entered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically it is unclear where the specification supports "treating the primary erosion zone", where the specification supports machining substantially the entire surface of the target to the level of the treated primary sputter erosion zone" and where the specification provides support for the range of reducing the Rs uniformity of the wafer by at least 10%. It is suggested to

provide page and line number in the specification to show where these limitations are supported.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunlop et al. (U.S. Pat. 6,030,514) in view of Marton et al. (U.S. PG Pub. 2003/0059640)

Regarding claim 1, Dunlop et al. teach a method of dry treating a target surface prior to using the target for sputtering (i.e. subsequent use). Dunlop teach subjecting at least a portion of the target (i.e. expose surface) to a surface treatment step to produce a target surface (i.e. exposed surface) treated portion whereby at least one of impurities present on the target surface treated portion is removed and a surface area of the target surface treated portion is reduced. (Column 4 lines 39-52) The surface treatment step comprises surface treating the portion of the target by one of ion milling or cleaning, **sputtering**, chemical polishing or etching, laser or electron beam ablation, electrolytic polishing or etching, **mechanical** or chemo-mechanical **polishing (i.e. machining)** or **combinations thereof**. (Column 4 lines 45-52) If a combination of process steps were

utilized as suggested above the target would be inherently removed from the sputtering chamber and mechanically polished (i.e. machining) since polishing in a sputter chamber would create contaminates. The target being machined includes mechanical polishing.

Regarding claim 1, The target is removed from the surface treatment process (i.e. sputtering chamber) and is prepared and packed for subsequent use in a sputtering deposition process. (Column 5 lines 27-35; Column 5 lines 10-15)

Regarding claim 1, Dunlop et al. teach that the burn-in time can be reduced by at least 10%. (Column 7 lines 30-32) Since the target burn-in time is reduced by at least 10% as required by Applicant the Rs uniformity on the wafer would also be reduced by at least 10%.

Regarding claim 6, Dunlop et al. teach the surface treated portion of the target assembly is placed in an enclosure to protect it during storage and shipment. (Column 8 lines 46-51)

Regarding claim 7, Dunlop et al. teach the enclosure is metallic and the metallic enclosure containing the target assembly is further placed into a different enclosure. (Column 8 lines 46-51)

Regarding claim 8, Dunlop et al. the target materials include aluminum, titanium, transition metals, refractory metals, silicides, indium tin oxide, composites, bonded assemblies or combinations thereof. (Column 8 lines 16-20)

The differences between Dunlop and the present claims is that the specifics of the sputtering treatment method prior to packaging is not discussed (Claims 1, 3),

treating the primary erosion zone is not discussed (Claim 1), machining substantially the entire surface of the target to the level of the primary sputter erosion zone is not discussed (Claim 1), the target surface being treated in an inert atmosphere is not discussed (Claim 4), the inert atmosphere being argon is not discussed (Claim 5).

Regarding claims 1, 3, Marton et al. teach sputtering to condition or clean the surface of a target prior to using the target for deposition. (Page 5 paragraph 0050) The target conditioning is performed by utilizing a magnetron to produce a plasma for about 10 to 40 minutes. The magnetron power is about between 0.1 kW to 1 kW. Ar gas is feed regulated to adjust the Ar gas pressure to maintain a constant cathode voltage. (Page 7 paragraph 0074)

Regarding treating the primary erosion zone of claim 1, Dunlop et al. already teach treating selected portions of the target. (Column 5 lines 16-22) Marton et al. utilizing a magnetron to condition the surface of the target by sputtering. The magnetron in Marton et al. would limit the treatment to primary sputter erosion zones. (Page 7 paragraph 0074)

Regarding machining substantially the entire surface of the target to the level of the primary sputter erosion zone of claim 1, Dunlop et al. teach that combinations of surface treatment can be utilized. Among those listed are sputtering and mechanical polishing. Dunlop et al. teach making the target flatter. Therefore when the combination of sputtering and mechanical polishing is utilized the entire surface would be machined to the level of the sputter erosion zone because flat targets are desired. That is when the target is sputtered the target would erode removing the contaminants

but producing erosion areas. To produce flatness for the target the mechanical polishing would be done over the entire target surface to flatten the target and therefore polish the target such that the entire surface of the target is at the level of the sputter erosion zone. (Dunlop et al. Column 45-52; Column 5 lines 16-22; Column 6 lines 60-67)

Regarding claims 4, 5, Marton et al. teach that Ar gas can be used as the inert gas. (Page 7 paragraph 0074)

The motivation for utilizing the features of Marton et al. is that it allows for conditioning or cleaning the target. (Page 7 paragraph 0074)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Dunlop by utilizing the features of Marton et al. because it allows for conditioning or cleaning of the target.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dunlop et al. in view of Marton et al. as applied to claims 1 and 3-8 above, and further in view of Ding et al. (US PGPUB 2003/0089601).

The difference not yet discussed is the magnetron to be rotatable and the magnetic component to be disposed on less than a 180-degree arc measured at the axis of rotation of the apparatus so as to produce a rotatable sputtering ion plasma on the target. (Claim 2)

Regarding claim 2, Ding discloses a sputtering apparatus comprising a rotating magnetron system comprising a magnetron that comprises less than 180 degrees (Figure 1) with corresponding side magnets (Figure 1) that provides the benefit of

smaller rotating magnetron is that the target power density can be maximized and results in uniform target erosion [0017].

The motivation for utilizing the features of Ding et al. is that it allows for maximizing target power density that results in uniform target density. (Paragraph 0017)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Ding et al. because it allows for maximizing target power density that results in uniform target density.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dunlop et al. in view of Marton et al. and Ding as applied to claims 1-8 above, and further in view of Arai et al. (U.S. Pat. 6,187,457).

The difference not yet discussed is the use of a FeNdB magnets.

Arai et al. teach that using a FeNdB magnet component in a magnetron is common in the art and therefore obvious (col. 6, 1. 50-57).

The motivation for utilizing the features of Arai et al. is that it allows for utilizing a magnetron for sputtering. (Column 6 lines 50-57)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Arai et al. because it allows for utilizing a magnetron for sputtering.

Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunlop et al. (U.S. Pat. 6,030,514) in view of Marton et al. (U.S. PG Pub. 2003/0059640) and Pavate et al. (U.S. Pat. 6,001,227).

Regarding claim 10, Regarding claim 1, Dunlop et al. teach a method of dry treating a target surface prior to using the target for sputtering (i.e. subsequent use). Dunlop teach subjecting at least a portion of the target (i.e. expose surface) to a surface treatment step to produce a target surface (i.e. exposed surface) treated portion whereby at least one of impurities present on the target surface treated portion is removed and a surface area of the target surface treated portion is reduced. (Column 4 lines 39-52) The surface treatment step comprises surface treating the portion of the target by one of ion milling or cleaning, **sputtering**, chemical polishing or etching, laser or electron beam ablation, electrolytic polishing or etching, **mechanical** or chemo-mechanical **polishing (i.e. machining) or combinations thereof**. (Column 4 lines 45-52) If a combination of process steps were utilized as suggested above the target would be inherently removed from the sputtering chamber and mechanically polished (i.e. machining) since polishing in a sputter chamber would create contaminates. The target being machined includes mechanical polishing.

Regarding claim 10, The target is removed from the surface treatment process (i.e. sputtering chamber) and is prepared and packed for subsequent use in a sputtering deposition process. (Column 5 lines 27-35; Column 5 lines 10-15)

Regarding claim 10, Dunlop et al. teach that the burn-in time can be reduced by at least 10%. (Column 7 lines 30-32) Since the target burn-in time is reduced by at least 10% as required by Applicant the Rs uniformity on the wafer would also be reduced by at least 10%.

Regarding claim 12, Dunlop et al. the target materials include aluminum, titanium, transition metals, refractory metals, silicides, indium tin oxide, composites, bonded assemblies or combinations thereof. (Column 8 lines 16-20)

The differences between Dunlop and the present claims is that the specifics of the treatment method prior to packaging is not discussed (Claims 10, 11), treating the primary erosion zone is not discussed (Claim 10), machining substantially the entire surface of the target to the level of the primary sputter erosion zone is not discussed (Claim 10), and the steps of assembling the target assembly into a sputtering apparatus to coat a substrate and sputtering the target to burn-in the target assembly wherein the burn-in time is reduced by at least 10% compared to an untreated target is not discussed (Claim 10).

Regarding the specifics of the treatment method prior to packaging of claims 10, 11, Marton et al. teach sputtering to condition or clean the surface of a target prior to using the target for deposition. (Page 5 paragraph 0050) The target conditioning is performed by utilizing a magnetron to produce a plasma for about 10 to 40 minutes. The magnetron power is about between 0.1 kW to 1 kW. Ar gas is feed regulated to adjust the Ar gas pressure to maintain a constant cathode voltage. (Page 7 paragraph 0074)

Regarding treating the primary erosion zone of claim 10, Dunlop et al. already teach treating selected portions of the target. (Column 5 lines 16-22) Marton et al. utilizing a magnetron to condition the surface of the target by sputtering. The

magnetron in Marton et al. would limit the treatment to primary sputter erosion zones.
(Page 7 paragraph 0074)

Regarding machining substantially the entire surface of the target to the level of the primary sputter erosion zone of claim 10, Dunlop et al. teach that combinations of surface treatment can be utilized. Among those listed are sputtering and mechanical polishing. Dunlop et al. teach making the target flatter. Therefore when the combination of sputtering and mechanical polishing is utilized the entire surface would be machined to the level of the sputter erosion zone because flat targets are desired. That is when the target is sputtered the target would erode removing the contaminants but producing erosion areas. To produce flatness for the target the mechanical polishing would be done over the entire target surface to flatten the target and therefore polish the target such that the entire surface of the target is at the level of the sputter erosion zone. (Dunlop et al. Column 45-52; Column 5 lines 16-22; Column 6 lines 60-67)

The motivation for utilizing the features of Marton et al. is that it allows for conditioning or cleaning the target. (Page 7 paragraph 0074)

Regarding the steps of assembling the target assembly into a sputtering apparatus to coat a substrate and sputtering the target to burn-in the target assembly wherein the burn-in time is reduced by at least 10% compared to an untreated target of claim 10, Dunlop et al. already implies placing the target in a sputtering chamber and burning-in the target. The burn-in time is reduced by at least 10%. (See Dunlop et al. discussed above; Dunlop et al. Column 7 lines 30-32) However, Pavate et al. explicitly

teach surface treatment and packaging and then installing the target into a sputtering chamber as required by applicants step (e). The target is burned-in as required by Applicant's step (f). Substrates are coated. (Column 11 lines 46-67; Column 12 lines 1-26)

The motivation for utilizing the features of Pavate et al. is that it allows for preventing blob formation. (Column 2 lines 30-31)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Dunlop et al. by utilizing the features of Marton et al. and Pavate et al. because it allows for conditioning or cleaning the target and for preventing blob formation.

Response to Arguments

Applicant's arguments filed February 26, 2009 have been fully considered but they are not persuasive.

In response to the argument that Dunlop et al. do not teach treating the target prior to utilizing it in a deposition process, it is argued that Dunlop et al. teach the target is removed from the surface treatment process (i.e. sputtering chamber) and is prepared and packed for subsequent use in a sputtering deposition process. (See Dunlop et al. discussed above)

In response to the argument that Dunlop et al. do not teach burn-in in the erosion zone followed by machining the target, it is argued that Dunlop et al. teach that combinations of surface treatment can be utilized. Among those listed are sputtering and mechanical polishing (i.e. machining). Dunlop et al. teach making the target flatter.

Therefore when the combination of sputtering and mechanical polishing (i.e. machining) is utilized the entire surface would be machined to the level of the sputter erosion zone because flat targets are desired. That is when the target is sputtered the target would erode removing the contaminants but producing erosion areas. To produce flatness for the target the mechanical polishing (i.e. machining) would be done over the entire target surface to flatten the target and therefore polish the target such that the entire surface of the target is at the level of the sputter erosion zone. (See Dunlop et al. discussed above)

In response to the argument that Marton et al. do not teach treating the target prior to performing a deposition process, it is argued that Dunlop et al. teach the target is removed from the surface treatment process (i.e. sputtering chamber) and is prepared and packed for subsequent use in a sputtering deposition process. (See Dunlop et al. discussed above)

In response to the argument that Marton et al. do not teach treating primary sputter erosion zones of the target during the treatment step, it is argued that the magnetron would limit the plasma treatment to specific zones of the target. (See Marton et al. discussed above)

In response to the argument that Marton et al. do not teach burn-in followed by machining, it is argued that Dunlop et al. teach that combinations of surface treatment can be utilized. Among those listed are sputtering and mechanical polishing (i.e. machining). Dunlop et al. teach making the target flatter. Therefore when the combination of sputtering and mechanical polishing (i.e. machining) is utilized the entire surface would be machined to the level of the sputter erosion zone because flat targets are desired. That is when the target is

sputtered the target would erode removing the contaminants but producing erosion areas. To produce flatness for the target the mechanical polishing (i.e. machining) would be done over the entire target surface to flatten the target and therefore polish the target such that the entire surface of the target is at the level of the sputter erosion zone. (See Dunlop et al. discussed above)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-Th with every Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rodney G. McDonald/
Primary Examiner, Art Unit 1795

Rodney G. McDonald
Primary Examiner
Art Unit 1795